modification in the numerical coefficients, if not in the form of the relation.

The data for making such an investigation are not yet in an available form. A comparison has been made between autumnal rainfall for "England, East," and the average yield for the counties of Cambridge, Essex, Norfolk, and Suffolk, which shows a similar relation but a magnified effect of autumnal rainfall upon the crop, and also two exceptional years which have not yet been investigated.

GEOLOGICAL NOTES.

FROM the Geological Survey we have received a memoir on the water supply of Lincolnshire from underground sources, with records of sinkings and borings, edited by Mr. H. B. Woodward, with contributions by Mr. W. Whitaker, Dr. H. F. Parsons, Dr. H. R. Mill, and Mr. H. Preston. In the introduction a description is given of the various geological formations with especial reference to the water-bearing strata. The bulk of the work is taken up with records of borings, among which we note particulars of a new boring in progress at Boultham for the supply of Lincoln; many records from the prolific locality of Bourn, where from one bore-hole five million gallons of water a day have been obtained; and other records from Scunthorpe, Skegness, Woodhall Spa, &c. Many analyses of water are given, and Dr. Mill contributes a useful section on rainfall, with a colour-printed map.

The Geological Survey has issued a memoir on the geology of West-Central Skye, with Soay, in explanation of sheet 70 of the geological map of Scotland. The memoir is written by Mr. C. T. Clough and Mr. Alfred Harker. The area is mainly occupied by the Tertiary igneous rocks of the Cuillin Hills, but it includes also some Torridonian rocks, and small tracts of Trias, Lower Lias, and Cretaceous. The occurrence of Cretaceous strata, probably of Upper Greensand age, is of especial interest. The Glacial and post-Glacial accumulations, the physical features and scenery are duly described. The memoir, in short, is in a handy form (pp. 59, and price 1s.), well suited as a guide on the ground, and as an introduction, as regards the volcanic rocks, to the larger work by Mr. Harker (lately noticed in NATURE) on the Tertiary igneous rocks of Skye.

Another memoir issued by the Geological Survey is on the geology of the country around Bridgend, being part vi. of the "Geology of the South Wales Coal-field," by Mr. A. Strahan and Mr. T. C. Cantrill, with parts by Mr. H. B. Woodward and Mr. R. H. Tiddeman. The district here described includes the Vale of Glamorgan, for the most part an area of Lias with irregular scatterings of Drift; an agricultural district, famed also for its Blue Lias lime, so well known in old times at Aberthaw, and now largely manufactured at Bridgend. The basement portions of the Lias at Sutton and Southerndown, conglomeratic in character, are duly described, as well as the littoral portions of the Keuper and Rhætic Beds. A small tract of the main coalfield enters the area, bounded by Millstone Grit and Lower Carboniferous Rocks, and the Old Red Sandstone appears in inliers. The bulk of the work is taken up with a description of the Keuper, Rhætic Beds and Lias, which furnish many points of interest.

The fifteenth report by Prof. W. W. Watts on photographs of geological interest in the United Kingdom (Brit. Assoc., Cambridge, 1904) is of a most satisfactory character. A clear profit of 130*l*. has been made. This shows that the work of collecting and storing typical photographs of geological features and phenomena, and of supplying copies to teachers and others in various parts of the world, has proved a great success, and a distinct service to geological and perhaps also to geographical science. This success is due to the indefatigable energy of Prof. Watts.

In his address to the Liverpool Geological Society, Mr. T. H. Cope took as his subject types of rock-flow in the Ceiriog valley and their analogies with river structure (*Proc*. Liverpool Geol. Soc., vol. ix., part iv.). The author points out the evidence of flow structures and other terrestrial movements in igneous and metamorphic rocks, and compares them with the known movements of water.

We have received No. 37 of vol. v. of "Spelunca" (*Bulletin* and *Mémoires* de la Société de Spéléologie). This contains a number of articles on caves and on underground waters, on prehistoric remains from caves, on the present subterranean flora, on contamination of waters, and on the use of fluorescence in detecting the flow of underground streams. A report on the sources of the water of Arcier, with special reference to the water-supply for the town of Besançon, is contributed by Prof. E. Fournier to the same periodical (No. 38), and he concludes that the supply from Arcier must at all costs be abandoned. The subject has excited much controversy owing to the fact that the probable sources of contamination through porous and fissured limestones are at a distance from the outlet of the stream at Arcier.

In the ninth report of the periodic variations of glaciers by Dr. H. F. Reid and M. E. Muret (*Arch. des Sc. phys. et nat. Genève*, xviii., 1904), the general record is one of decrease.

The records of the Geological Survey of India (vol. xxxi. part iii.) contain an article by Mr. R. D. Oldham on the glaciation and history of the Sind Valley, Kashmir, a subject illustrated by six excellent photographic views, which exhibit features produced respectively by glaciers and by rivers, and afford support to the view of the author of a diversion of the drainage since the glaciers attained their greatest dimensions.

A report on the Jammu coal-fields has been written by Mr. R. R. Simpson, mining specialist to the Geological Survey of India (*Mem*. Geol. Surv. India, vol. xxxii. part iv.). The coal-fields lie in a mountainous country, varying from three thousand to nine thousand feet above sea-level, and the strike of the coal-bearing rocks does not conform to any of the main natural features. The prospects of working the coal with profit are not considered good, in present circumstances, as the expenses would be great on account of the inclined and broken character of the rocks, the possibility of landslips, and of trouble from water. Otherwise a fairly good steam-coal may be obtained.

A geological map of Cyprus, by Mr. C. V. Bellamy, has been issued by Mr. Stanford (price 6*s*.). It is accompanied by a key or short explanation, in which the author describes the physical features and the various geological formations which range from Cretaceous to Pliocene and Pleistocene. Between the Oligocene and Pliocene there is a break, marked by the occurrence of basic igneous rocks, which have baked and altered the Oligocene (Idalian) limestones. These igneous rocks, which comprise serpentine, variolite, gabbro, &c., form a broad belt of mountainous ground in the south-central portion of the island. The map, which is produced on a scale of 5½ English miles to one inch, is printed in colours, and clearly shows the extent of the main geological divisions. It will be a useful guide to those interested in the geology, whether from a scientific or practical point of view. The economic products include building stones, marble, pottery clay, gypsum, &c.

Our knowledge of the geology of South Africa proceeds apace. We have received vol. vii., part iii., of the *Transactions* of the Geological Society of South Africa, which contains among other articles an essay by Dr. F. H. Hatch and Dr. G. S. Corstorphine on the petrography of the Witwatersrand conglomerates, with special reference to the origin of the gold. The original explanation was that the Rand conglomerates were ancient placer deposits, in which the gold was as much a product of denudation as the pebbles which accompany it. The authors show that the theory of the subsequent infiltration of the gold is most in accordance with the facts. The gold is practically confined to the matrix of the conglomerate, and occurs there in crystalline particles in association with other minerals of secondary origin.

Mr. E. Jorissen, in the same *Transactions*, deals with some intrusive granites in the Transvaal, the Orange River Colony and in Swaziland. These old granites, mostly grey in colour, penetrate the crystalline schists which are regarded as of Archæan age, but they do not intrude into the Witwatersrand series. Mr. J. P. Johnson contributes further notes on some pigmy stone implements from Elandsfontein No. 1. They are regarded as scrapers belonging to the Neolithic stage of culture.

In his address to the South African Association for the Advancement of Science (Johannesburg meeting, 1904), Dr. Corstorphine took for his subject the history of strati-

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graphical investigation in South Africa, and in a table he gives the groupings successively introduced by A. G. Bain, A. Wyley and others up to those of G. A. F. Molengraaff and F. H. Hatch.

We have received from the Minister of Mines, Victoria, a diagram, compiled and drawn up by the director of the Geological Survey, Mr. E. J. Dunn, showing the yield of gold and other statistics from 1851 to 1903. The gross value of the gold is stated to be 266,945,344*l*. The greatest yield was in 1856.

We have received the annual progress report of the Geological Survey of Western Australia for 1903, by Mr. A. Gibb Maitland, Government Geologist. This includes observations on the Pibara and Murchison gold-fields, on the Arrino copper deposits, the Irwin River coal-field, &c., miscellaneous notes on minerals, including gypsum and diatomite, and notes on water supply. The report is accompanied by several maps.

The progress of vertebrate palæontology in Canada forms the subject of an essay by Mr. Lawrence M. Lambe (*Trans.* Roy. Soc. Canada, series 2, vol. x.). As he remarks, our knowledge of this life-history began when Sir William Logan, in 1841, discovered amphibian footprints in the Lower Coal-measures at Horton bluff in Nova Scotia. Since then remains of vertebrates have been found in rocks from the Silurian to the Pleistocene, and a full list is given, together with a bibliography of the subject.

In the *American Journal of Science* (December, 1904) two new species of reptiles from the Titanothere Beds (Oligocene) of Dakota, are described by Mr. F. B. Loomis. These are *Crocodilus prenasalis* and *Chrysemys inornata.* Some derived Cretaceous fossils are recorded also from the same strata, which form a part of the White River formation, and the author is led to regard the beds as of fluviatile origin.

The *American Journal of Science* for January contains an article on the submarine great canyon of the Hudson River, by Dr. J. W. Spencer. The early work of the Coast Survey brought to light a depression extending from near New York to the border of the continental shelf, and J. D. Dana was the first to recognise this feature as the submerged channel of the Hudson River, formed when the continent stood at a greater altitude above the sea than it does now. Later on, Prof. A. Linden Kohl discovered that the channel became suddenly transformed into a canyon near the continental border, reaching to a depth of 2400 feet below the surface of the submerged plain, which was then about 400 feet beneath sea-level. Following on to these observations, Dr. Spencer has pointed out that the channel was traceable to much greater depths—the canyon section having sunk from 6000 to 7000 feet, and the valley beyond to 9000 feet. He maintains that the period of great elevation coincided with the early Pleistocene. Since then there has been a subsidence to somewhat below the present level, followed by a re-elevation of 250 feet, as seen in the shallow channels of the shelf.

The *American Journal of Science* for February contains an important essay on the isomorphism and thermal properties of the feldspars, by Mr. Arthur L. Day and Mr. E. T. Allen. To the same journal Dr. Albrecht Penck contributes an interesting article on climatic features in the land surface, and indicates how the features of past as well as present climates may be discerned. Instances are seen in areas that were formerly covered by ice and are now exposed to river action. They are seen in desert regions, as in those of the Great Salt Lake and of the Sahara, where ancient shore lines and old river valleys have been traced. In some mountain areas evidence of river action, preceding glacial action, has been noticed. Dr. Penck points out that a study of the oscillations in the situation of the climatic belts of the earth is fraught with interest, and that observations on the erosional forms of rocks and on the corresponding deposits derived from them assist in the interpretation of climatic conditions.

In the *Bulletin* from the Laboratories of Natural History of the State University of Iowa (vol. v., No. 4) there is a series of papers on the loess by Prof. B. Shimek. The loess of Natchez and of the lower Mississippi valley is of special interest, inasmuch as in that region loess was first recognised in America by Lyell in 1846. The researches of the author afford arguments against both the aqueous and glacial theories of its origin. The characteristic fossils are terrestrial upland species of land snails. Even the extremely delicate shells of snails' eggs are preserved in the loess. Natchez lies far south of the limits of glaciation, and the molluscan fauna does not support the notion of a glacial climate. The æolian theory offers the best explanation. The discovery of human remains in a deposit regarded as loess near Lansing, in Kansas, is discussed, and Prof. Shimek concludes that the deposit is not loess, but a talus. Considering, again, the relations of loess to the Iowan drift, the author points out that there were several periods of loess formation, inter-Glacial and post-Glacial. Far beyond the border of the newer drift sheets, however, the sharp lines of distinction between the successive accumulations disappear, and there the deposits of loess probably represent the combined accumulation of several inter-Glacial and later drift periods. The essays are illustrated by pictorial views and figures of the mollusca. In another article Mr. F. J. Seaver describes and illustrates the Discomycetes of eastern Iowa.

The "Materials and Manufacture of Portland Cement," by Mr. E. C. Eckel, with an essay on the cement resources of Alabama, by Mr. E. A. Smith, form the contents of *Bulletin* No. 8, Geological Survey of Alabama. In that State there is found an extensive series of limestones capable of furnishing material for the manufacture of Portland cement, while clays and shales necessary to complete the mixture are abundant.

In an article on the genesis of the magnetite deposits in Sussex Co., New Jersey (*Mining Magazine,* December, 1904), Mr. Arthur C. Spencer concludes that they are connected in origin with intrusive dioritic pegmatites. To the same magazine Mr. W. H. Heydrick contributes a paper on the physical and commercial conditions of the Kansas oil-fields. The area extends over more than ten thousand square miles. In 1889 the yield was 500 barrels of oil, while in ten months during 1904 the yield was more than four million barrels.

A reconnaissance in Trans-Pecos Texas, by Mr. G. B. Richardson (Univ. of Texas, Mineral Survey, *Bulletin* No. 9), was undertaken mainly to determine the conditions of occurrence of underground water. The author was enabled, however, to make general observations on the successive formations from the pre-Cambrian to the Cretaceous and Quaternary, and on the occurrence of coal, salt, petroleum, and sulphur. The presence of underground water was found to be widespread, but in a number of places the wells contain much gypsum and other salts. The report is accompanied by a geological map and pictorial views.

Some account of the exploration of the Potter Creek Cave in California, is given by Mr. W. J. Sinclair (Univ. of California Publications, *Amer. Archaeol. and Ethnol.,* vol. ii., No. 1). The cave is about one mile south-east of the United States fishery station at Baird, on the McCloud River, and it lies in a belt of carboniferous limestone at an elevation of 1500 feet above sea-level, and about 800 feet above the river-level at the mouth of Potter Creek. Remains of various vertebrate animals were obtained from fan-like deposits of earth and stalagmite-cemented breccia, which formed the floor in a large chamber, above which there were vertical chimney-like openings. With the exception of the stalagmitic growths and fallen blocks, the entire cave deposit was brought in through the vertical chutes. Apart from fragments, more than 4600 determinable specimens were collected of dissociated limb bones, jaws, and teeth. Complete skeletons were not common. Associated parts of the skeletons of squirrels and wood-rats, of a snake (Crotalus), and a bat were found; also several complete limbs of *Arctotherium simum*, remains of Megalonyx, Mastodon, *Elephas primigenius,* and a new genus named Euceratherium, a member of the cavicorn division of Artiodactyla, which combines characters of several groups. Of the fifty-two species listed, twenty-one belong to extinct forms. No human remains were found, but some very doubtful "implement-like bone fragments" are described and figured. The cave-fauna is older than the Glacial period in California, and it is remarked that the 1500 foot contour marks approximately the present elevation of an earlier valley stage beneath which the existing cañons are trenched.

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